REMARKS

Applicant has carefully reviewed and considered the Office Action mailed on March 13, 2003, and the references cited therewith.

New claims 42-45 are added. These are supported by Fig. 1, its description, and the original claims 1, 4, and 5 of the application, and are within the elected invention. Claims 1-45 are now pending in this application. Please charge any required fee to Deposit Account No. 19-0743.

§112 Rejection of the Claims

Claims 1-41 were rejected under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Applicant respectfully traverses. The Office Action asserts that "adjacent" is too general a term. Applicant respectfully traverses. The mere notion that the claims are broad is not sufficient to make them indefinite. In fact, the language recited in claim 1 is definite and covers all devices that include all the recited limitations

> "a glass substrate doped with a laser species;
>
> a waveguide defined within the substrate; and
>
> a diode pump laser with an extended waveguide within the diode laser's resonator cavity, the extended diode laser cavity being positioned adjacent the substrate waveguide so that pump light from along a length of the extended waveguide of the diode laser's resonator cavity is transferred into the substrate waveguide along a length of the substrate waveguide."

The Office Action asserts that it is unclear how the pump is positioned. Applicant respectfully traverses. Applicant has been amended the claim to read so that pump light from along a length of the extended waveguide of the diode laser's resonator cavity is transferred into the substrate waveguide along a length of the substrate waveguide" solely to clarify limitation already in the claim. The amended claim clearly recites the limitation desired by the inventor in terms readily understood by a person of skill in the art, and clearly distinguishes over the cited art.

The Office Action asserts that it is unclear regarding the pump laser having an extended waveguide. Applicant has amended the claim to clarify the element.

Claims 1-16 were rejected as omitting essential elements. Claims 17-22 were rejected as omitting essential steps. (Applicant again notes that neither "step" nor "steps" are recited in any claim, but rather the claim recites "A method ... comprising:".) Applicant respectfully traverses both rejections. The application clearly indicates that "some" or "one" of the embodiments include the features and elements described for Figure 1. Applicant respectfully traverse the Examiners assertion that FIG. 1 is "the" embodiment of the invention. The reflectors/DBR gratings, cavity length relationships, and DBR grating spacings (and the elements of the associated method) are described as features for some embodiments, not "the" embodiment. Since the recited elements have no gap, the claims appear to be in condition for allowance, and such action is respectfully requested.

§102 Rejection of the Claims

Claims 1-5, 11, 17-19, 23-29, 32-33, and 39-41 were rejected under 35 USC § 102(b) as being anticipated by *Chang et al.* (U.S. 5,142,660). Applicant respectfully traverses. In contrast to the assertion by the Examiner, the pump light entering from the left in Chang's FIG.1 shows the pump laser is outside the substrate shown, and emits light into the end of waveguide 14, and that grating 36 reflects the pump light (apparently this reflected light is 36A, but this is not described). A laser's resonator cavity is the portion typically between two reflectors, and including the gain medium. Chang et al. say "In addition to removing the pump light from the output, the grating causes the pump light to make another pass through the gain medium again. Therefore, the grating 36 causes an increase in the intensity of the output light and removes the pump light from the output." There is no indication that any reflected light goes back into the resonator cavity of the laser diode. The gain medium discussed here is that of the superfluorescent waveguides outputting 1560 nm light, not the 980nm or 1420nm pump light used by Chang et al. Thus, waveguide 14 does not form part of the diode laser's resonator cavity.

Chang does not describe nor suggest an "extended waveguide within the diode laser's resonator cavity" and the corresponding relationships of claim 1 as a whole. Further, Chang et al. describe that pump light source 28 is external (see Figure 3) and that pump light is input to an end 30 of waveguide 14 (column 3 line 37). Grating 36 is described as removing pump light

from the output of waveguide 14 (by reflecting the pump light for a second pass through waveguide 14), but not as forming a feedback element for the pump light source such that waveguide 14 could be described as an extended waveguide within the pump laser cavity (column 4 lines 8-23). Thus claim 1 and its dependent claims distinguish over the cited reference. Accordingly, these claims appear to be in condition for allowance, and such action is respectfully requested.

Regarding claim 4, Chang et al. describe a superfluorescent light source (column 1 line 46; column 3 line 41) not a laser resonator (there is no feedback mechanism, since all three output gratings pass the 1560 nm light. Note also, the 1560 light has a bandwidth of 20 nm on either side of 1560 nm, another indication of superfluorescent light, not laser light. For this reason, in addition to the reasons listed above for claim 1, claim 4 distinguishes over the cited reference. Accordingly, this claim appears to be in condition for allowance, and such action is respectfully requested.

Regarding claim 5, Chang et al. describe a gratings 36, 70, and 72 that reflect the pump light to remove it from the output beams (column 4 lines 10-15; lines 60-62) not a laser resonator feedback mechanism, since all three output gratings pass the 1560 nm light. Note also, the 1560 light has a bandwidth of 20 nm on either side of 1560 nm, another indication of superfluorescent light, not laser light. For this reason, in addition to the reasons listed above for claim 1, claim 5 distinguishes over the cited reference. Accordingly, this claim appears to be in condition for allowance, and such action is respectfully requested.

Regarding claim 11, Chang et al. describe a gratings 36, 70, and 72 that reflect the pump light to remove it from the output beams (column 4 lines 10-15; lines 60-62) not a mirror. Further, this is not a laser feedback mechanism for the substrate waveguide(s), since all three output gratings pass the 1560 nm light. Note also, the 1560 light has a bandwidth of 20 nm on either side of 1560 nm, another indication of superfluorescent light, not laser light. For this reason, in addition to the reasons listed above for claim 1, claim 11 distinguishes over the cited reference. Accordingly, this claim appears to be in condition for allowance, and such action is respectfully requested.

Regarding claim 17, this claim has been amended to distinguish over the cited Chang et

al. reference, and to broaden the claim by removing elements. As described above, Chang does not transmit light from along a length of the pump laser cavity into and along a length of the substrate waveguide, since the pump light reflector gratings 36, 70, and 72 do not form part of the pump laser resonator cavity. The pump source is described "a pump light source 28 such as a high power laser diode provides a pump light input to an end 30 of the waveguide 14," This diode laser is not described as including waveguide 14 (nor waveguide 104 of Figure 4) within its resonator cavity. Rather, the pump-light reflecting gratings 36, 70, and 72 "remove" the pump light from the output. Thus, claim 17 and its dependent claims distinguish over the cited references. Accordingly, these claims appear to be in condition for allowance, and such action is respectfully requested.

§103 Rejection of the Claims

Claims 6-10, 12-16, 20-22, 30-31, and 34-38 were rejected under 35 USC § 103(a) as being unpatentable over Chang et al. (U.S. 5,142,660) in view of Kaminow (U.S. 4039249). Applicant respectfully traverses. Kaminow describes tuning accomplished by establishing a variable electric field in the propagating medium (abstract), which is the lithium niobate film 22 deposited on glass substrate 20, not in a "cladding deposited on the reflection grating of the substrate waveguide." Further, the grating is a tuned pass filter for the light from an external source (e.g., HeNe laser) 14, not a reflection grating that forms part of the substrate waveguide's laser resonator. Further, since the gratings of Chang et al. and of Kaminow are each filters that pass the laser light that results from the pump light, neither gratings in the cited reference are involved with the feedback or lasing of any pumped laser. Since Chang does not form a laser cavity with its gratings, modifying it with a tunable pass grating such as Kaminow does not result in the present invention of the pending claims. Thus, claim 6 as clarified by amendment to claim 1 and 5, further distinguishes over the cited art. Accordingly this claim appears in condition for allowance, and such action is respectfully requested.

For claims 7-10, 12-16, and 20-22, the Examiner has failed to provide a prima facie case of obviousness, as described below. Accordingly, each one of these claims appear in condition for allowance, and such action is respectfully requested.

Regarding claim 7, neither Kaminow nor Chang et al. disclose "a resistive element for heating and thermally expanding the reflection grating of the substrate waveguide to alter the wavelength reflected by the grating."

Regarding claim 8, neither Kaminow nor Chang et al. disclose "a piezo-electric coating."

Regarding claim 9, neither Kaminow nor Chang et al. disclose "an electro-optic polymer." This also applies to claim 21.

Regarding claim 10, neither Kaminow nor Chang et al. disclose "one or more additional reflection gratings" nor "electrodes for selectively applying an electrical potential across each grating cladding to vary the index of refraction in accordance therewith and render the grating transparent or reflective."

Regarding claim 12, neither Kaminow nor Chang et al. disclose "the pump diode laser is a dielectric waveguide abutted at one end to an antireflection-coated gain section of the diode laser and at another end to a highly reflective mirror."

Regarding claim 13, neither Kaminow nor Chang et al. disclose "the extended waveguide cavity of the pump diode laser is a dielectric waveguide abutted at one end to an antireflection coated gain section of the diode laser and at another end to a reflection grating."

Regarding claim 14, neither Kaminow nor Chang et al. disclose "the extended waveguide cavity of the pump diode laser has a lower index of refraction than the substrate waveguide and forms part of a cladding thereof."

Regarding claim 15, neither Kaminow nor Chang et al. disclose "the extended waveguide cavity is abutted to the surface of the substrate waveguide and separated therefrom by a layer of cladding with apertures for transmitting pump light into the substrate waveguide." This also applies to method claim 20.

Regarding claim 16, neither Kaminow nor Chang et al. disclose the claim as a whole "wherein the separation between the extended waveguide cavity and the substrate waveguide is such that pump light is transmitted by evanescent coupling." The pump waveguide of Chang et al. is outside the laser resonator.

Regarding claim 21, neither Kaminow nor Chang et al. disclose "an electro-optic polymer."

Regarding claim 22, neither Kaminow nor Chang et al. disclose "a **plurality of spaced apart reflection gratings** ... and further wherein an electro-optic polymer... by selectively applying an electrical potential to the grating claddings to render **one** grating **reflective**."

Conclusion

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney (612-373-6949) to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Commissioner of Patents, Washington, D.C. 20231, on this 13th June 2003.

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